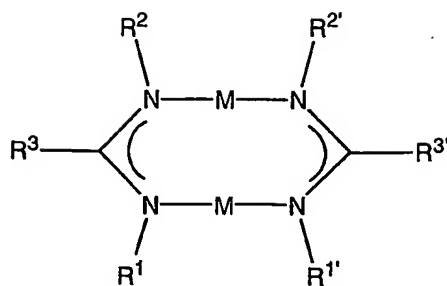


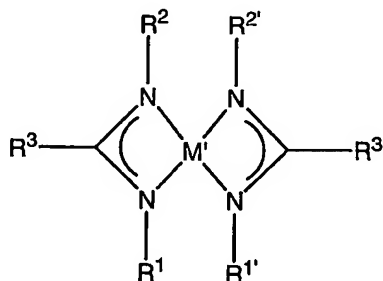
1. A process for forming a thin film comprising a metal, comprising:  
exposing a heated substrate alternately to the vapor of one or more volatile metal amidinate compounds, and then to a reducing gas or vapor, to form a metal coating on the surface of the substrate.
- 5 2. The process of claim 1, wherein said reducing gas is hydrogen.
3. A process for forming a thin film comprising a metal nitride, comprising:  
exposing a heated substrate alternately to the vapor of one or more volatile metal amidinate compounds, and then to a nitrogen-containing gas or vapor, to form a metal nitride coating on the surface of the substrate.
- 10 4. The process of claim 3, wherein the nitrogen-containing gas is ammonia.
5. A process for forming a thin film comprising a metal oxide, comprising:  
exposing a heated substrate alternately to the vapor of one or more volatile metal amidinate compounds, and then to an oxygen-containing gas or vapor, to form a metal oxide coating on the surface of the substrate.
- 15 6. The process of claim 5, wherein the oxygen-containing vapor is water vapor.
7. The process of any of the preceding claims, in which the volatile metal amidinate compound has a formula selected from the group consisting of  $M(I)AMD$ ,  $M(II)AMD_2$  and  $M(III)AMD_3$  and oligomers thereof, where M is a metal and AMD is an  
20 amidinate moiety.
8. A process according to any of the preceding claims, in which a volatile metal(I) amidinate compound is represented by the general formula



wherein the R<sup>n</sup> represent hydrogen, alkyl groups, fluoroalkyl groups or other non-metal atoms or groups, R<sup>n</sup> being any one of the groups R<sup>1</sup> through R<sup>3'</sup>, and wherein R<sup>n</sup> are the same or different.

5            9. The process of claim 7, where M is selected from the group consisting of copper(I), silver(I), gold(I) and iridium(I).

10. A process according to any of claims 1-6, in which a volatile metal(II) amidinate compound is represented by the general formula

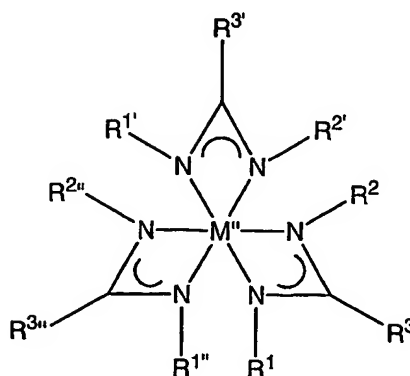


10        wherein the R<sup>n</sup> represent hydrogen, alkyl groups, fluoroalkyl groups or other non-metal atoms or groups, R<sup>n</sup> being any one of the groups R<sup>1</sup> through R<sup>3'</sup>, and wherein R<sup>n</sup> are the same or different.

11. The process of claim 10, where M' is selected from the group consisting of cobalt, iron, nickel, manganese, ruthenium, zinc, titanium, vanadium, chromium,  
15        europium, magnesium and calcium.

12. A process according to any of claims 1-6, in which a volatile metal(III)

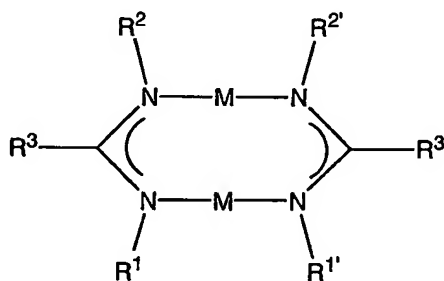
amidinate compound is represented by the general formula



wherein the  $R^n$  represent hydrogen, alkyl groups, fluoroalkyl groups or other non-metal atoms or groups,  $R^n$  being any one of the groups  $R^1$  through  $R^{3''}$ , and wherein  $R^n$  are the same or different.

13. The process of claim 12, where  $M''$  is selected from the group consisting of lanthanum, praseodymium and the other lanthanide metals, yttrium, scandium, titanium, vanadium, niobium, tantalum, chromium, iron, ruthenium, cobalt, rhodium, iridium, aluminum, gallium, indium, and bismuth.

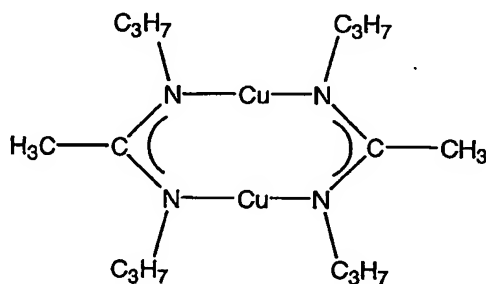
14. A composition of matter that is a volatile metal(I) amidinate represented by the general formula for a dimer,



or other oligomers of the same monomeric unit, wherein  $M$  is selected from the metals copper, silver, gold, iridium, lithium and sodium, and wherein the  $R^n$  represent hydrogen,

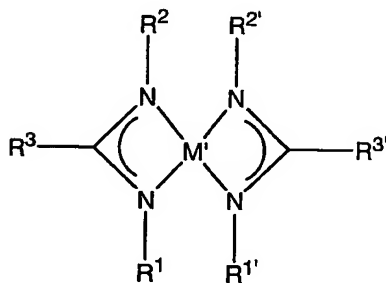
alkyl groups, fluoroalkyl groups or other non-metal atoms or groups,  $R^n$  being any one of the groups  $R^1$  through  $R^3$ , and where  $R^n$  are the same or different.

15. A composition of matter as in claim 13 having the chemical name copper(I) *N,N'*-diisopropylacetamidinate and represented by the structural formula



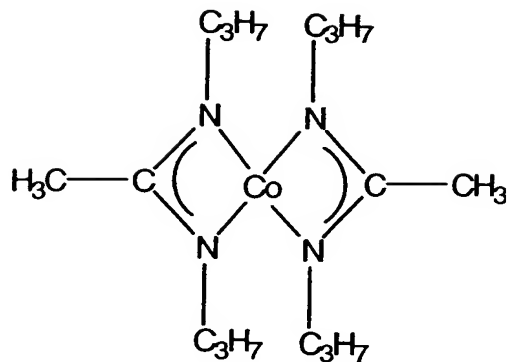
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16. A composition of matter that is a volatile metal(II) bis(amidinate) represented by the general formula

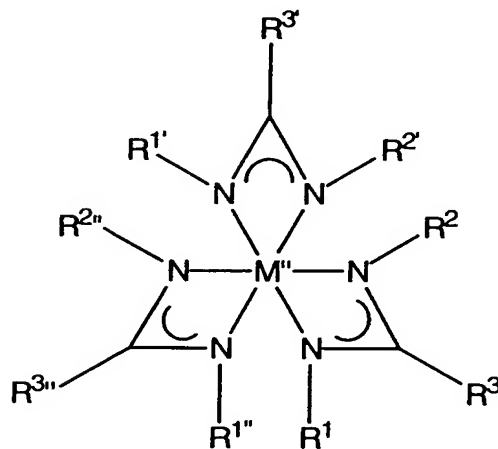


10 or its oligomer, wherein the metal M is selected from cobalt, iron, nickel, manganese, ruthenium, zinc, titanium, vanadium, chromium, europium and calcium, and wherein the  $R^n$  represent hydrogen, alkyl groups, fluoroalkyl groups or other non-metal atoms or groups,  $R^n$  being any one of the groups  $R^1$  through  $R^3$ , and where  $R^n$  are the same or different.

15 17. A composition of matter as in claim 15 having the chemical name cobalt(II) bis(*N,N'*-diisopropylacetamidinate) and structural formula



18. A composition of matter that is a volatile metal(III) tris(amidinate) represented by the general formula



wherein the metal M is selected from lanthanum, praseodymium and the other lanthanide metals, yttrium, scandium, titanium, vanadium, chromium, iron, ruthenium, cobalt, rhodium, iridium, and bismuth, and wherein the  $R^n$  represent hydrogen, alkyl groups, fluoroalkyl groups or other non-metal atoms or groups,  $R^n$  being any one of the groups  $R^1$  through  $R^{3''}$ , and where  $R^n$  are the same or different.

19. A composition of matter as in claim 18 having the chemical name  
lanthanum(III) tris(*N,N'*-diisopropylacetamidinate) and structural formula

